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ABSTRACT

A study of news refraction was conducted to determine how well the press has functioned in popularizing scientific views and findings on a subject with direct implications for a controversial social issue. In reporting the marijuana question, the press produced a certain amount of refraction or news-slanting. For example, science articles publicized were somewhat more pathology-oriented and variable in judgment than science articles not publicized, hinting at a mixture of conservative and sensationalistic tendencies. At the same time, personal views of authorities publicized by the press were less likely to affirm marijuana-related pathologies than the majority of scientific reports appearing in scientific literature, primarily when considering the issues of addiction and escalation. The actual marijuana expertise of authorities quoted by the press was, on the average, low. These trends waxed and waned according to particular mass journals or journal types making up the sample. The main current of the findings, however, leads to the conclusion that the press, in reporting the marijuana issue, has managed to keep refraction within reasonable bounds. (Author/AEA)

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Science News of Controversy: The Case of Marijuana

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David J. Russo, "The Origins of Local News in the American Country Press: 1840s-1870s (3/12/79).

IN MODERN TIMES the news media have become a major mechanism for the popularization and diffusion of scientific knowledge. This is important because most areas of science have long since become remote and unintelligible to non-scientists, yet science has become increasingly influential in the determination of human affairs. The news media frequently function to mediate the hiatus between scientific circles and lay publics by translating the meaning of scientific work into terms which are understandable to non-scientists.

The reporting of science news has, in recent decades, received growing attention by social scientists as well as by news professionals. A number of studies have been done on the increasing specialization of the science reporter as a journalistic type,[1] on the special problems involved in interpreting scientific findings and theories for a mass audience,[2] and on the competence with which this has been done by reporters.[3]

Ideological controversies have become one of the more important dimensions of science news reporting. Beyond the esoteric novelty and excitement of scientific discoveries as such lie their implications for human life, or their application, if any, to the solution of human problems. The potential utility of scientific discoveries represents the kind of question that most people ask about science and is what makes science a newsworthy subject. In an empirical age numerous social problems are conceptualized as having scientific solutions. While responding to such problems, laymen become ever more reliant on the expertise of scientific authorities and the scientist acquires considerable prestige and the power to define the nature of reality for others, not only to state what is, but also what ought to be.[4] This latter type of consideration, of course, leads science beyond its own ideal of detached observation and value neutrality into the world of political decision-making and ideological controversy. In this respect it is not uncommon for a scientific community to be divided as to the practical meanings of its discoveries,

or the uses to which they should be put. Thus many social controversies are characterized by scientific advocacy on opposing sides of an issue. The ideological pluralism of the scientific community over social issues becomes itself newsworthy, an item on which the press has shown a growing tendency to report in recent years.[5] Instances of such controversy are diverse, including scientific debate over the safety and uses of nuclear energy, the impact and control of all kinds of environmental pollutants, the dangers of various food additives and the implications of genetic research, to mention but a few.

The Marijuana Controversy

Another such issue reported by the press has been the marijuana controversy. Marijuana serves as a good case in point because:

1) Not only has the public debate been acrimonious, it has penetrated to all parts of the country. As an issue its scope is national. Not since prohibition has there been such popular discord over the merits of allowing or suppressing the consumption of a product.

2) The putative crux of the issue involves empirical questions which presumably are subject to review and solution within the framework of scientific inquiry: what are the effects of marijuana on mind and body, on human relations? Does its use threaten well-being and healthy functioning or is it a relatively innocuous substance? These are questions bearing on a rational legal policy toward marijuana which one would suppose are capable of scientific solution.

3) Finally, there has not yet, apparently, occurred a decisive crystallization of consensus among scientists and researchers themselves. A thorough scouring of the scientific literature on marijuana produces a wide range of opinion among scientists on the relative dangers of the weed. For example, some researchers have asserted that marijuana causes brain damage; others say it does not; some see a direct causal connection between marijuana use and mental illness, while others deny any such link. Some research has suggested that marijuana lowers male testosterone levels, reduces cellular immunity to disease, leads to the use of other drugs, and so on. Other research supports none of these effects. This kind of disagreement among scientists creates a situation in which antagonists in the

political arena are able to pick and choose among "expert opinions," selecting out evidence which suits their particular purpose while ignoring contradictory evidence.[6]

To say that there is disagreement among scientists about marijuana is not to say that all opinion is of equal merit, influence or reputation within the community of specialists who have studied marijuana. Certain opinions may represent the view of only a handful of researchers and be discounted by the majority of scientists. Other views may represent predominant opinion among the majority of marijuana experts. Which of these views are most often conveyed for public consumption? The press, of course, plays an important role by popularizing the results of scientific studies and by interviewing or quoting medical and scientific authorities for their opinions on the issue. How well has the press functioned in reporting on marijuana as a scientific question?

News Refraction

In performing this task, it is hardly reasonable to expect the marijuana "reality" portrayed by the press to coincide in every particular with predominant and prestigious opinion in the scientific community. There are bound to be certain discrepancies. The images of reality projected by various communication media are always somewhat out of focus, always producing a partial rather than perfect reflection of events. In the phraseology of Kurt and Gladys Lang, "Because every communication system is less than perfect in this regard, the content that emerges always bears the imprint of the system. The influence of the communication system on the content is designated here as *refraction*."[7]

The concept of refraction suggests media-generated distortions of both kind and degree. Assuming some degree of refraction, we ask, how great is the discrepancy between reputable scientific interpretations of marijuana and the popularization of these interpretations by the press? In addition we may ask, how are these discrepancies produced? Generally speaking, there are two principal kinds of refraction. One kind is produced through simple inaccuracy; the other is a matter of selectivity. In the end, of course, both modes of refraction may function to produce essentially the same results. For instance, one possible outcome to which both inaccuracies and se-

lectivity contribute may be recognized as an "ideological" pattern, in which the press reveals systematic bias, favoring one particular side of an issue.[8] Another major possibility is perhaps best designated by the term "sensationalism," in which case the press is shown to exaggerate the extreme views on both sides of an issue, as opposed to favoring either side over the other.[9]

The empirical meaning of ideological and sensationalistic refraction within the context of the marijuana issue can best be detailed once certain aspects of the methodology for this study have been explained. Nonetheless, these considerations direct us to now ask: in reporting on the marijuana question, has the press revealed systematic ideological biases? Has the press been sensationalistic? And if so, to what extent? These represent the basic empirical questions pursued in this study.

It should be emphasized that no attempt is made here to evaluate the accuracy with which the press has reported scientific views on marijuana. Rather, attention is limited to the press' selectivity. In particular, two important areas of selectivity will be considered. First, the selection by the press of specific research to be reported is examined. Which studies on marijuana are publicized by the press and which are not? What do publicized studies say about the harmfulness of marijuana and how does this compare with what is said by studies which are not reported? How reputable are the studies the press chooses to report? Is the research most highly respected within scientific circles the kind most likely to receive publicity? Is the scientific merit of a study relevant or irrelevant to the likelihood of its popularization by the press? Second, the selection of scientific authorities for their personal views on the issue will be considered. What is the scientific status of those individuals represented by the press as being authorities? What is the basis of their presumed expertise on the subject of marijuana? To what extent do their individual views coincide with predominant and prestigious opinion revealed in the scientific literature?

METHODOLOGY

The first task in collecting data for this study was to assess the nature of predominant and prestigious opinion on marijuana among marijuana researchers. This was done through a content analysis of

the scientific literature, the procedures for which are summarized below. The aim of the analysis was to measure how harmful different scientific reports judge marijuana to be. In addition, the scientific repute of each study was measured through the method of citation counts. This procedure is also described in detail below. Then a second content analysis was performed on a sample of press articles which had reported scientific findings and opinions on marijuana. As with the scientific literature, citation counts were undertaken for quoted authorities to measure their scientific standing and status as marijuana experts. The two samples were then compared in order to judge the degree to which the marijuana reality reported in the press coincided with the marijuana reality reported in the scientific literature.

The Samples

Index Medicus, internationally esteemed as the most comprehensive index to biomedical research available, served as the sampling frame for science articles on marijuana. From this index a listing was obtained of all scientific articles published in English on marijuana, cannabis, hashish, or THC between 1967 and 1972.[10] Certain of these articles could not be located; others proved irrelevant for the purposes of the study (articles dealing exclusively with the botany of *cannabis sativa*, for example). The final sample consisted of 245 science and medical journal articles on marijuana. The articles were of widely different types and included laboratory experiments, clinical studies, social surveys, literature reviews and commentary.

A thorough listing or indexing of scientific research reported in the popular press does not exist. For magazines the most useful index is *Readers Guide to Periodical Literature*. From *Readers Guide* were located marijuana articles appearing in three news magazines (*Newsweek*, *Time* and *U.S. News and World Report*), ten "family" magazines (*Good Housekeeping*, *Holiday*, *House and Garden*, *Life*, *Look*, *Mademoiselle*, *McCall's*, *New York Times Magazine*, *Readers' Digest* and *Senior Scholastic*), eight opinion and commentary magazines (*Atlantic Monthly*, *Business Week*, *Commonweal*, *Current*, *Fortune*, *Ramparts*, *National Review* and *Saturday Review*) and five popular health or science magazines

(*Popular Science, Science Digest, Science News, Scientific American,* and *Today's Health*). As for newspapers, a few have their own topical indexes, but there is, of course, no such national index. A decision was made, then, to survey three large metropolitan dailies: The New York *Times,* the Chicago *Tribune* and the New York *Daily News.* In addition to being among the nation's five highest circulation dailies, certain stylistic and/or ideological differences among the three papers may be assumed. Thus, the *News* represents the archetypical tabloid, the *Times* is generally conceded to be the most thorough public affairs paper in the land and to have liberal leanings, while the *Tribune* is usually regarded as being politically conservative in its orientation. The sensational, liberal and conservative reputations of these three papers respectively were thought to be theoretically well-tailored to the types of refraction to be judged in this study.

Given these popular sources, some rather simple search procedures were followed for locating marijuana articles and for determining whether or not they ought to be included in the analysis. To begin with, any newspaper or magazine article indicating by its title that it had anything to do with drugs of any kind was identified and examined. The article then had to meet two criteria to be included in the sample: first, it had to make some kind of judgment about the harmfulness or harmlessness of marijuana, and second, the judgment had to be attributed to some kind of "scientific authority." Since we are only interested here in the reporting of scientific opinion, the views of police personnel, government officials and the like were not counted (unless, of course, they also had scientific credentials). Scientific credentials were imputed to anybody referred to by the press as "doctor," "scientist" or "researcher." This included M.D.s, psychiatrists among them, whether in medical research or private practice, and Ph.D.s in traditional scientific disciplines (chemistry, biology, etc.) as well as certain social sciences (psychology, sociology and anthropology). A large number of drug stories which detailed life in the "drug culture," police operations, plans for drug rehabilitation programs, etc., failed to meet these criteria and were excluded from the analysis. If the results of a specific study were reported, the news article had to make a direct reference, citing the date and science journal in which the study appeared, so that the study could be identified from the *Index Med-*

icus sample. Thus, for example, a news article might begin, "In the January issue of the *Journal of the American Medical Association* researchers reported that marijuana . . ." Often, however, an authority might be quoted by the press as saying something like, "Research has shown that marijuana . . ." without specifying any particular study. In this event, it would be recorded that an authority's personal opinion had been reported by the press, but not an actual scientific study.

Altogether, 275 newspaper and magazine articles were located which had reported scientific views or findings on marijuana between 1967 and 1972.

Content Analysis Procedures

Two major kinds of questions are addressed in the type of marijuana research that is of greatest interest to the public: What are the *consequences* of marijuana use? And, what is the *etiology*, or "causes," of persistent, non-medical use? The first question can be broken down into consideration of particular kinds of consequences. The basic types are: 1) *physical* consequences—what are the effects of marijuana use on the human body? 2) *psychological* consequences—what are the effects of marijuana use on the human personality? 3) *social* consequences—what are the effects of marijuana use on interpersonal relations and on the functioning of the larger community?

The second general question represents an effort to explain why individuals are attracted to, or motivated to use, marijuana in the first place. Most explanations focus on various personality traits of the user or on certain social conditions of his environment. Finally, within the framework of marijuana effects and marijuana etiology, several particular issues have received considerable attention, namely: is marijuana, in any sense, "addictive"? Does marijuana use "lead to" the use of other drugs? Should marijuana be legalized? Thus, content analysis procedures were designed to incude the following categories: marijuana effects (physical, psychological, social); marijuana etiology (personality factors, social factors), and special issues (the addiction hypothesis, the escalation hypothesis, the legal issue).

For coding purposes, these general categories were further broken down into more specific units and assigned score values. For

example, if marijuana effects are being considered we ask whether this particular effect is relatively strong or relatively mild, whether the effect is chronic or acute and whether the authority's conclusion about this effect is qualified or unqualified. Strong effects were given a score of two, while chronic effects and unqualified conclusions about effects were both assigned a value of one. The remaining categories were all given a score of zero. Thus, when these coding judgments were combined, the highest possible score is four (a strong, chronic effect which is unqualified), while the lowest score possible is zero (a mild, acute effect which is qualified). The other general categories (etiology, special issues) are broken down and scored in a similar fashion.

In addition to numerical values, judgments on marijuana were also assigned algebraic values (positive, negative) to indicate whether an authority judges marijuana to be essentially harmful or nonharmful. Thus, if the authority being coded affirms that marijuana is harmful or dangerous—that its implications are "pathological" in some sense—a positive sign was given by the coder. If, however, the authority disconfirms the harm, dangers or pathologies imputed to marijuana, a negative sign is given. In the former case, a positive score means that the authority has taken, to some degree, a "pathology position" toward marijuana. In the latter sense, a negative score means that the authority has taken, to some degree, an "antipathology position."[11]

In sum, judgments on marijuana by researchers or scientific authorities as they appeared in both the scientific literature and the popular press were broken down by coders and assigned algebraic scores. On one side of the scale, scores may range from a high of +4.0 to 0.0; on the other side, from 0.0 to -4.0. Positive scores indicate a pathology view of marijuana; negative scores an antipathology view.[12]

Coder Reliability. Three volunteers were paid to code a sample of 31 marijuana articles using the content categories of the pathology scale. The scores assigned were correlated with one another and also with the scores the author had assigned to the same articles. The zero-order correlations (r) between coders ranged from .80 to .93. The mean correlation between coders was .87.

Measuring Scientific Repute

Reliably assessing the content of scientific research or statements by scientific authorities is one problem. Assessing the scientific merit, credibility or repute of such research or authorities is, perhaps, an even more difficult problem.

One approach to evaluation problems of this kind has gained increasing favor in recent years: the use of citation data. The basic idea is that reports regarded as significant contributions to a particular area of research will be cited and used in the research of other scientists working on similar problems; if a scientist's work is highly regarded it will be cited frequently by other scientists; if not highly regarded it will be infrequently cited.

Since 1964 a novel indexing tool entitled *Science Citation Index* has been published. Like other science indexes, SCI gives coverage to a large number of the world's most widely used science journals and puts out both an author and a subject index. The unique feature of SCI is that under every article indexed appears a listing of all other science articles which have made reference to or cited the original article in question. Thus, if one wants to get a fair idea as to the impact a particular article has had in its field, the article can be looked up in either the author or subject index and the number of citations made to it by other scholars can be counted. Similarly, if one wants some idea as to a particular individual's status among his colleagues in the field, his name can be searched in the author index and a citation count made of the total number of references to all of his published work.

Citation counts as indicators of scientific repute carry certain weaknesses. A review of the problems associated with citation counts as indicators and a defense of their use can be found in articles by Stephen and Jonathan Cole[13] and Eugene Garfield.[14] Both conclude that science citation counts provide an imperfect but basically reliable measure of scientific repute.

If determination of the scientific status of a research report or article were based solely on the absolute number of citations received by the article, it is clear that early marijuana articles would have a built-in advantage over those published later. An article written in 1967 would have more exposure within the scientific community than an article written in 1972. However, this advantage is easily

controlled by simply calculating the average number of times per year an article has been cited since its publication. Since this study only considers science articles published between 1967 and 1972, citation counts were conducted for every year from 1967 through 1974. This gives articles published in 1972 at least a two-year period in which to have circulated and be cited, and makes it possible to calculate a yearly citation average.

For purposes of this study, an authority's personal prestige may be thought of in two ways: 1) general reputation as a scientist, and 2) specific reputation as an expert in marijuana research. These two aspects of an authority's reputation may be empirically related but are analytically distinct. Thus a particular authority may have relatively high standing in one category of expertise and relatively low standing in the other. This is especially likely to be true in the case of an authority who enjoys high status as a scientist generally but has little or no significant expertise in marijuana research as such.

An authority's general scientific reputation is measured by counting the number of citations to all of his or her published scientific work, regardless of its subject matter. On the other hand, marijuana expertise is measured by counting the number of citations to all of one's published work on marijuana exclusively. Unlike article citations, the absolute number of an authority's science and marijuana citations appears to be the best indicator of personal reputation. Works by an individual often continue to be cited in the research literature for years afterward. When this happens it is, of course, an indication of one's personal reputation among colleagues. Thus, the greater the absolute number of citations to an authority's works, the greater his personal reputation may be regarded to be.

Strategies of Analysis

To recapitulate, the basic aims of this study were to ascertain the amount of refraction produced by the press in reporting scientific views and research on marijuana. In doing this, we also wish to ascertain the extent to which particular types of refraction are most characteristic of news coverage of the marijuana issue, ideological biases or sensationalism representing the two major possibilities.

In order to measure refraction it is necessary to determine which aspect of a scientific study or opinion is most influential in attract-

ing coverage by the press: its content (i.e., the kinds of judgments made about marijuana) or its scientific repute (i.e., how well regarded a study or authority is among other scientists). To the degree that the former is most ifluential, we may conclude that the press has been biased in its selection of authorities, that it prefers only to publicize certain kinds of information.

Ideological refraction means giving systematic publicity only to opinions or findings which support a particular side of the marijuana controversy. Thus if the press were ideologically conservative, only research which shows marijuana to be harmful would be publicized; if ideologically liberal, only research which shows marijuana to be relatively harmless would be publicized. In either case, the scientific credibility of the research reported would be, at best, of secondary concern. On the other hand, sensationalistic refraction means exaggerating the extreme views on both sides of the marijuana issue. Both pathology and antipathology positions would, in fact, be publicized so long as they were extreme enough. Middle-range findings and opinions would be ignored. As with ideological refraction, the sensationalism pattern would reflect a general indifference to the scientific credibility of the research publicized.[15]

What kind of empirical evidence is needed to indicate a predominance of one or the other of these patterns of news coverage? One type of analysis would compare mean pathology scores, pathology score deviations and mean science citations. If the press minimized refraction, the mean pathology score of science articles and authoritative opinions pubicized by the press would be comparable to the mean pathology score of all marijuana articles coded from the scientific literature. Furthermore, the standard deviation of pathology scores for publicized views should also be comparable to that of all reputable scientific research on marijuana. That is, whatever diversity of opinion characterizes reputable research on marijuana within the scientific community should be reflected by news coverage of this research. Most importantly, the mean scientific repute of publicized studies and authorities should be high relative to the repute of all scientific research coded.

If the press evinces a conservative bias, the mean pathology score of research and opinions which it chooses to publicize would be high relative to the mean pathology score of all marijuana research, while the standard deviation for pathology scores of publicized

views would be relatively small. If, on the other hand, the press is liberal, the mean pathology score of publicized views should be relatively low, or on the antipathology side of the scale. The standard deviation would, again, also be relatively small. In either case, the scientific repute of publicized views would likely be, on the average, relatively low.

Finally, if the press is merely sensational we would expect a relatively moderate mean pathology score for publicized views (extreme pathology and antipathology findings would, if both publicized, tend to cancel each other out in the calculation of an average score), but a large standard deviation.[16] As with ideological refraction, we would expect to find that publicized views had, on the average, relatively low scientific repute.[17]

FINDINGS

In what follows, press coverage of actual scientific articles and research findings are considered first. Then attention is turned to the publicity given presumed scientific and medical authorities for their personal views on marijuana.

TABLE 1.
Mean Pathology Scores, Standard Deviations and Mean Science Citations of Science Articles Publicized in the Press Compared to Those of Science Articles Not Publicized, 1967-1972.

	N	Frequency of Times Publicized	Mean Pathology Score	Pathology Score Standard Deviation	Mean Science Citations
Science Articles Publicized	20	59	+1.55	2.29	15.7
Science Articles Not Publicized	225	—	+1.11	2.06	2.8
Totals	245	59	+1.15	2.08	3.4

The first observation to be made of the data shown in Table 1 is that, in terms of pathology content, the similarities between publicized and unpublicized marijuana research are more pronounced than their differences. This is true both of mean pathology scores and pathology score deviations. In these respects, then, refraction appears to be of minor proportions. Both in the scientific literature

as a whole and in studies publicized by the press, marijuana is portrayed, on the average, as being a rather mildly harmful drug ($+1.11$ to $+1.55$ on the p scale). The degree of disagreement among studies not publicized ($s = 2.06$) is relatively well reflected by the degree of disagreement among studies which were publicized ($s = 2.29$). What little refraction does exist indicates that the press has a slight tendency to publicize more pathology-oriented research (hence a somewhat higher mean p score), while at the same time, an inclination to report more extreme findings at both ends of the p scale (hence a somewhat larger standard deviation). If these patterns were strong, they would suggest a mixture of conservatism and sensationalism. As it is, however, research reported in the press appears to be a fairly faithful representation of research reported in the scientific literature.

These conclusions are fortified by looking at the crucial variable of scientific repute. The mean number of science citations per article publicized by the press is impressively high, especially when compared to the mean number of citations to research not publicized by the press (15.7 vs. 2.8). What this shows is a considerable amount of sensitivity by the press toward the popularization of reputable marijuana research.

The generally reputable quality of scientific research publicized by the press is further illustrated by comparing the five science studies on marijuana most frequently publicized in the press with the five most influential marijuana studies appearing in the scientific literature.

Of the five most influential studies on marijuana appearing in the scientific literature from 1967 through 1972, only one (Holtzman, *et al.*) failed to gain notice by any of the popular sources in this sample.[17] Of the five marijuana studies most frequently publicized in the press, two—the Isbell and Weil reports—ranked first and second among the five most influential marijuana studies in the scientific literature. In general, all but one of the most publicized reports had relatively high citation frequencies within scientific circles; only Geber, *et al.* received a mediocre amount of scientific recognition.[18]

These findings reinforce the generalization that the press has done a creditable job in promoting well-known scientific research on marijuana.

TABLE 2.
The Five Science Articles on Marijuana Most Frequently Publicized in the Press Compared to the Five Most Influential Marijuana Articles Appearing in the Scientific Literature, 1967-1972.

The Scientific Literature Article	Mean Science Citations Per Year	Number of Times Cited in Press
1. H. Isbell, *et al.* "Effects of (−) delta-9-transtetrahydrocannabinol in man." *Psychopharmacologia*, 1967, vol. 11.	31.6	5
2. A. T. Weil, *et al.* "Clinical and psychological effects of marijuana in man." *Science*, 1968, vol. 172.	30.3	12
3. L. E. Hollister. "Marijuana in man: three years later." *Science*, 1971, vol. 172.	25.6	1
4. L. Lemberger, *et al.* "Delta-9-tetrahydrocannabinol: metabolism and disposition in long-term marijuana smokers." *Science*, 1971, vol. 173.	22.3	2
5. D. Holtzman, *et al.* "1-delta-9-tetrahydrocannabinol: neurochemical and behavioral effects in the mouse." *Science*, 1969, vol. 163.	19.0	0

The Press Article	Number of Times Cited in Press	Mean Science Citations Per Year
1. A. T. Weil, *et al.* "Clinical and psychological effects of marijuana in man." *Science*, 1968, vol. 162.	12	30.3
2. H. Kolanski and W. Moore. "Effects of marijuana on adolescents and young adults." *Journal of the American Medical Association*, 1971, vol. 216.	8	12.3
3. H. Isbell, *et al.* "Effects of (−) delta-9-transtetrahydrocannabinol in man." *Psychopharmacologia*, 1967, vol. 11.	3	31.6
4. W. F. Geber, *et al.* "Effect of marijuana extract on fetal hamsters and rabbits." *Toxicology and Applied Pharmacology*, 1969, vol. 14.	3	3.6

One additional observation, however, needs to be made. Returning attention to Table 1, it is evident that relatively few science articles were selected for publicity during the period 1967-1972. Of the hundreds of articles on marijuana appearing in the scientific litera-

ture during this time, only 20 were publicized in this particular sample of three newspapers and 26 magazines. On the other hand, some of these studies were reported more than once by different popular journals. In all, these 20 scientific reports were publicized a total of 59 times in a variety of the popular sources considered in this study. What this suggests is that the press is more likely to rely on the views and opinions of individual authorities than it is to publicize the results of actual studies. In fact, more than three-quarters (77%) of the press articles coded made no explicit references to specific marijuana studies, but merely reported the statements of individuals presumed to have scientific or medical expertise. Who are these authorities? What is their scientific credibility as marijuana experts? How well do their views on the subject square with marijuana research recorded in the scientific literature?

In Table 3 pathology scores have been calculated for press articles in a manner similar to the way in which this was done for scientific articles. All judgments on marijuana attributed to an authoritative source were scored by the coder. Thus we are able to compare the mean pathology scores and standard deviations of press articles with those of science articles. In addition, the status of authorities quoted in popular sources—both as scientists and as marijuana experts—may be compared with that of researchers who have published their findings in scientific journals.

TABLE 3.

Mean Pathology Scores, Standard Deviations and Median Science Citations Assigned to Authoritative Source in the Press Compared to Those Assigned to Sources in the Scientific Literature, 1967-1972.

	Scientific Literature	The Press
Number of Articles Coded	241	275
Mean Pathology Score	+1.15	+0.41
Pathology Score Standard Deviation	2.08	2.64
Number of Authorities Coded	196	370
Median Marijuana Citations Per Authority	6.9	0.2
Median Science Citations Per Authority	24.8	38.9

As before, the marijuana reality protrayed in the press does not appear to be radically different from that portrayed in the scientific literature. Though this again emerges as the central finding, some interesting difference between the patterns of press coverage revealed in Tables 1 and 3 warrant comment. For one thing, the

mean pathology score of press articles shown in Table 3 is somewhat lower, not higher, than the mean pathology score for science journal articles. For another thing, the pathology score standard deviation for press articles is larger than was the case when only considering the standard deviation of publicized scientific studies (2.64 vs. 2.29). A lower mean *p* score is indicative of a "liberal" rather than a "conservative" tendency; a larger standard deviation suggests a greater amount of "sensationalism." Though these figures show a certain amount of refraction, they simply do not represent gross distortions introduced by the press in publicizing the marijuana issue as a scientific question.

It may be asked, however, in which specific areas was the press' slightly more liberal interpretation of marijuana produced?

As can be seen in Table 4, those aspects of the marijuana issue reported by the press which are most at variance with the scientific literature are the "addiction" and "escalation" hypotheses. On the average, authorities quoted by the press maintained a moderate antipathology position on these two particular issues (i.e., that marijuana is not addictive nor does it lead to the use of other drugs), while predominant opinion in the scientific literature revealed a moderate pathology view (i.e., that to a certain extent marijuana can be addicting and may lead to the use of other drugs.)[17] On most other aspects of the marijuana issue, scientific views reported in the press coincide very closely with findings reported in the scientific literature.

The most striking shortcoming in the press' performance is its apparent neglect to regularly publicize the views of genuine marijuana experts. A sizeable proportion of the science or medical authorities quoted by the press for their views had, in fact, never done any research on marijuana. More than two-thirds (69%) of the publicized authorities searched out in *Science Citation Index* had no citations to any work on marijuana pubished in science journals. The median number of marijuana citations to authorities publicized by the press was 0.2, compared to a median of 6.9 marijuana citations per reesarcher publishing in the scientific literature. On the other hand, the general scientific status of authorities reported in the press appears, on the average, to be relatively high. Only 15% of those publicized authorities searched out in SCI had no citations of any kind to their scientific work and the median number of cita-

TABLE 4.
Mean Pathology Scores Assigned to Press Articles by Subcategories of the Marijuana Pathology Scale as Compared to Those Assigned Articles in the Scientific Literature, 1967-1972.

	Marijuana Effects			Marijuana Etiology		Special Issues		
	Physical	Psychological	Social	Personality Factors	Social Factors	Addiction	Escalation	Legalization
Science Journal Articles	+0.58	+1.16	+0.39	+.172	+2.14	+1.87	+1.08	+0.17
Press Articles	+0.31	+0.96	+0.38	+1.80	+1.11	-0.59	-0.65	-1.03

tions per authority quoted in the press is close to being two-thirds greater than that for the sample of marijuana researchers taken from the scientific literature (38.9 vs. 24.8). Generally speaking, then, authorities given publicity by the press were likely to have had sound credentials in some scientific area, but were much less likely to have any credentials in the area of actual marijuana research.

Presented in Table 5 is more specific documentation of the press' relative failure to consult renowned marijuana experts, as well as a clearer conception of whom the press tends most to rely on in place of experienced marijuana researchers.

TABLE 5.
The Ten Authorities Most Frequently Cited in the Press Versus the Ten Authorities Most Frequently Cited in the Scientific Literature, for Their Views on Marijuana, 1967-1972.

The Press

Authority	Number of Times Cited in Press	Number of Science Citations to Marijuana Research
1. J. L. Goddard	16	0
2. A. T. Weill	14	238
S. F. Yolles	14	0
3. R. Egeberg	12	0
4. H. Kolarski	11	51
5. H. Brill	10	0
B. S. Brown	10	0
D. B. Louria	10	0
6. L. Grinspoon	9	49
R. W. Baird	9	0

The Scientific Literature

Authority	Number of Science Citations to Marijuana Research	Number of Times Cited in Press
1. L. E. Hollister	251	3
2. A. T. Weil	238	14
3. H. Isbell	227	5
4. L. Lemberger	183	1
5. E. A. Carlini	117	0
6. S. Agurell	100	0
7. D. Holtzman	95	0
8. F. X. Melges	83	1
9. J. E. Manno	82	0
10. L. D. Clark	79	1

Of the ten most reputable marijuana researchers in the scientific community, only Weil was also among the ten most publicized authorities in the press. Furthermore, among the most publicized authorities, seven out of the ten had never done any recognized marijuana reesarch at all. Of these seven, only Louria – a medical researcher at Cornell University – is renowned as a scientist. The others were influential primarily as administrators of various research or health institutions. Thus, during the period of time covered in this study, Goddard was Commissioner of the Food and Drug Administration and Egeberg was an assistant secretary of Health, Education and Welfare; both Yolles and Brown were directors of the National Institute of Mental Health; Brill was director of Pilgrim State Hospital, a psychiatric hospital on Long Island; Baird was the director of a private drug clinic in New York City. Of the three most publicized authorities who had actually done research on marijuana, Weil was a medical student at Harvard, Kolanski a practicing psychiatrist in Philadelphia and Grinspoon an academic psychiatrist at Harvard University.

To summarize, a majority of the authorities whose views on marijuana were reported by the press were reputable scientists. Only a small minority of these scientists, however, had themselves conducted any reputable research on marijuana. The most likely category of "expert" to receive attention by the press appears to be medical administrators or heads of well known government and science agencies. The latter types, of course, tend to be publicly visible, with open access to the channels of mass communication. In part, such figures may themselves seek the attention of the news media to promote their personal views, as well as the views of the institutions which they represent. In part, they are the most prominently available authorities for reporters seeking a story.

Having made some generalizations about the press as a whole and its performance in reporting the marijuana issue as a scientific question, it may be asked: what is the record of the specific mass journals or journal types which comprise the sample? Do newspapers, for example, show characteristically different patterns than magazines? Are there important differences among the three newspapers sampled, or for that matter, among the different magazine types? The relevant data on these questions are presented in Table 6.

TABLE 6.
The Performance of Selected Newspapers, News Magazines, and Special Interest Magazines in Reporting on Marijuana as a Scientific Question, 1967-1972.

	Number of Articles Coded	Mean Pathology Score	Pathology Score Standard Deviation	Number of Authorities Coded	Median Marijuana Citations	Median Science Citations
NEWSPAPERS						
C. *Tribune*	42	+1.23	2.59	51	0.1	34.6
N.Y. *Daily News*	60	+0.65	2.67	49	0.1	17.8
N.Y. *Times*	85	-0.01	2.79	104	0.3	46.4
Overall	187	+0.48	2.74	204	0.2	35.2
NEWS MAGAZINES						
Newsweek	10	+0.22	2.09	18	0.3	113.0
Time	16	+0.17	2.64	24	0.4	46.5
U.S. News	9	-0.34	2.46	9	0.0	35.5
Overall	35	+0.05	2.39	51	0.2	45.8
SPECIAL INTEREST MAGAZINES						
Health-Science	17	+1.26	1.85	31	0.4	39.5
Family	22	+0.87	2.47	54	0.3	46.3
Opinion-Commentary	14	-1.41	2.39	30	0.4	32.0
Overall	53	+0.39	2.24	115	0.3	46.0

Among the three newspapers coded, some minor trends may be identified. Publishing 85 articles and reporting the views of over 100 authorities on the subject, the *Times* gave by far the greatest amount of coverage to the marijuana issue. The *Tribune* gave the least amount of coverage to the issue, publishing 42 articles and 51 authorities. It should be noted that, whereas the *News* published a third more articles than the *Tribune*, it actually reported the views of fewer authorities. The *Times* was somewhat more prone than the other papers to publicize extreme views on both sides of the issue ($s = 2.79$) yet, overall, gave greater coverage to the antipathology perspective ($\bar{x}_p = -0.01$) while its authorities were, on the average, quite reputable scientists. The *Tribune* was somewhat less likely to report extreme views on both sides of the issue ($s = 2.59$), was more likely to publicize the pathology perspective ($\bar{x}_p = +1.23$), and generally cited authorities of fairly high scientific repute. In terms of the pathology content of its articles, the *News* was intermediate between the *Times* and the *Tribune* ($\bar{x}_p = +0.65$, $s = 2.67$) while, in terms of its authorities, it was least successful in publicizing highly reputable sources. That the mean pathology score for the *Times* was the lowest of the three papers sampled, while the *Tribune*'s was highest, is congruent with the liberal and conservative reputations of these journals respectively. On the other hand—though perhaps more superficial in its coverage of the marijuana issue—the *News* did not prove to be the most sensationalistic of the papers sampled.

Among news magazines, *Newsweek* and *Time* produced virtually equivalent mean pathology scores (+0.22 and +0.17 respectively) but *Newsweek* was less inclined to report extreme views on both sides of the issue ($s = 2.09$ vs $s = 2.64$). Thus, though both fairly liberal, *Newsweek* was more consistently so, while *Time* was somewhat more sensationalistic. However, of the three news magazines, *U.S. News and World Report* actually produced the lowest mean pathology score (-0.34). Given the conservative reputation of the latter publication, this is a somewhat surprising statistic. At the same time, the "quality" of news coverage provided by *U.S. News and World Report* on the marijuana issue appears to have been inferior to that given by *Time* and *Newsweek*. This conclusion is based on the fact that only nine authorities were cited by *U.S. News*, none of whom had ever done any research on marijuana and

whose general scientific status was, on the average, considerably lower than for authorities reported in the other news magazines, especially *Newsweek*.

Turning from news journals to special interest journals, "health-science" magazines produced the highest mean pathology score (+1.26) as well as the lowest pathology standard deviation (1.85) of any of the popular sources sampled in this study. Together, these two statistics mark health-science magazines as the most conservative popular sources on the marijuana issue. Given that health-science magazines manifestly function to popularize scientific information, one would expect them to be in closer contact with genuine specialists and highly reputable authorities. Such did not prove to be the case in reporting the marijuana issue, however, as the record of health-science magazines in publicizing experienced marijuana experts was really no better than that of other popular journals, while the general scientific status of their authorities was only mediocre.

"Family" magazines produced another moderate surprise. One would suppose family magazines more inclined to exercise a conservative bias on an issue like marijuana, yet the mean pathology score for family magazines was only +0.87 and the standard deviation was 2.47, indicating a tendency to report both pathology and anti-pathology sides of the issue. In addition, the scientific repute of authorities publicized in family magazines was relatively high—higher, in any event, than the average repute of authorities appearing in health-science magazines.

Finally, "opinion-commentary" magazines showed the greatest liberal tendency of all the popular sources sampled, with a mean pathology score of -1.41 and a moderate pathology standard deviation of 2.39. The general scientific standing of authorities publicized in opinion-commentary magazines was, with the exception of the New York *Daily News*, the lowest of all journals sampled.

In general, the overall differences between newspapers, news magazines and special interest magazines were not very great. For instance, the mean pathology scores for all three press categories were relatively low and closely clustered, ranging from a low of +0.05 (news magazines) to a high of only +0.48 (newspapers). Thus, with respect to the pathology content of their articles, all general press categories reported a slightly more liberal version of

marijuana than was suggested by the scientific literature itself. At the same time, pathology standard deviations ranged from 2.24 (special interest magazines) to 2.74 (newspapers). The latter statistic suggests that, of the three journal types, newspapers tended to be the most sensationalistic. The median number of marijuana citations per authority publicized was uniformly small for all press categories, while the general scientific status of authorities publicized in special interest and news magazines was, on the average, somewhat higher than was the case for newspapers.

SUMMARY AND CONCLUSIONS

This study of news refraction investigated how well the press has functioned in popularizing scientific views and findings on a subject with direct implications for a controversial social issue. In reporting the marijuana question, the press was seen to have produced a certain amount of refraction. For example, science articles publicized by the press were somewhat more pathology-oriented and variable in their judgments than science articles not publicized, hinting at a mixture of conservative and sensationalistic tendencies. At the same time, the personal views of authorities publicized by the press were less likely than the majority of scientific reports appearing in the scientific literature to affirm marijuana-related pathologies. This was most evident when considering the issues of "addiction" and "escalation." In this respect a moderate liberal tendency was indicated. Perhaps most noteworthy, the actual marijuana expertise of authorities quoted by the press was, on the average, low. The majority of "experts" cited by the press had simply done little or no scientific work themselves on the subject of marijuana. Finally, these trends were shown to wax and wane according to the particular mass journals or journal types making up the sample.

These observations notwithstanding, the main current of the findings leads one to conclude that, as a whole, the press has done a respectable job in reporting the marijuana issue. Thus, for example, the scientific repute of most studies publicized by the press, relative to scientific studies not publicized, was very high. Likewise, the general scientific status of authorities quoted (as opposed to their specific credentials as marijuana researchers) was also, on the average, very high. Most importantly, the degree of refraction

shown by our indicators was small, or only moderate, in virtually every case. In short, refraction as measured in this study has taken on the character of minor trends or tendencies rather than major, systematic distortions. As a whole, the similarities between the press' interpretations of marijuana as a scientific question and the assessment of marijuana derived from the scientific literature itself, appear to be more pronounced than their differences. On the strength of these results it may be concluded that the press, in reporting the marijuana issue, has managed to keep refraction within reasonable bounds.

NOTES

1. E.g., see Lee Z. Johnson, "Status and Attitudes of Science Writers," *Journalism Quarterly*, 34:247-51 (1957); Pierre C. Fraley, "The Education and Training of Science Writers," *Journalism Quarterly*, 40:323-28 (1963); Israel Light, "Science Writing: Status and Needs," *Journalism Quarterly*, 37:53-60 (1960); William Witt, "The Environmental Reporter on U.S. Daily Newspapers," *Journalism Quarterly*, 51:697-704 (1974); Michael Ryan and Sharon L. Dunwoody, "Academic and Professional Training Patterns of Science Writers," *Journalism Quarterly*, 52:239-46 (1975).

2. E.g., Hillier Krieghbaum, "Reporting Scientific Information Through the Mass Media," *Journalism Quarterly*, 40:291-99 (1963); Kenneth G. Johnson, "Dimensions of Judgment of Science News Stories," *Journalism Quarterly*, 40:315-32 (1963); Serena Wade and Wilbur Schramm, "Mass Media as Sources of Public Affairs, Science and Health News," *Public Opinion Quarterly*, 33:197-209 (1960); G. Ray Funkhouser and Nathan Maccoby, "Tailoring Science Writing to the General News Audience," *Journalism Quarterly*, 50:220-26 (1973); James E. Grunig, "Three Stopping Experiments on Communications of Science," *Journalism Quarterly*, 51:387-99 (1974).

3. E.g., Raymond J. Tarleton, "Accuracy and Comprehension in Science Writing," *Journalism Quarterly*, 30:69-71 (1953); M. Timothy O'Keefe, "The Mass Media as Sources of Medical Information for Doctors," *Journalism Quarterly*, 47:95-100 (1970); Phillip J. Tichenor, Clarice N. Olien, Annette Harrison and George Donohue, "Mass Communication Systems and Communication Accuracy in Science News Reporting," *Journalism Quarterly*, 47:673-83 (1970); James W. Tankard Jr. and Michael Ryan, "News Source Perceptions of Accuracy of Scientific Coverage," *Journalism Quarterly*, 51:209-25 (1974); D. Lynn Pulford, "Follow-Up Study of Science News Accuracy," *Journalism Quarterly*, 53:119-21 (1976).

4. For an analysis of the sociological category of "expert" and the social distribution of knowledge, see Peter L. Berger and Thomas Luckman, *The Social Construction of Reality: A Treatise in the Sociology of Knowledge* (New York: Anchor Books, 1966).

5. E.g., Bruce J. Cole, "Trends in Science and Conflict Coverage in Four Metropolitan Newspapers," *Journalism Quarterly*, 52:465-71 (1975).

6. For a summary of contradictory scientific findings on marijuana, see Erich Goode, *The Drug Phenomenon: Social Aspects of Drug Taking* (Indianapolis: Bobbs-Merrill, 1973), pp. 3-5; for an analysis of the politicization of the marijuana issue, see Goode's "Marijuana and the Politics of Reality," *Journal of Health and Social Behavior*, 10:83-94 (1969).

7. *Collective Dynamics* (New York: Crowell, 1961), p. 438.

8. Ideological refraction may be more or less deliberate. Thus the rise of "advocacy" journalism in the 1960s and '70s represents a self-conscious decision to take an ideological posture toward reporting certain issues. On the other hand, the "slanting" of news reports may incorporate ideological biases in more covert or even unconscious ways. For assessments of the advocacy position, see John W.C.

Johnston, Edward J. Slawski and William W. Bowman, "Professional Values of American Newsmen," *Public Opinion Quarterly*, 36:522-40 (1972-73); Morris Janowitz, "Professional Models in Journalism: The Gatekeeper and the Advocate," *Journalism Quarterly*, 52:618-26 (1975). For analyses of covert or informal sources of ideological bias, see Warren Breed, "Social Control in the News Room: A Functional Analysis," *Social Forces*, 23:326-33 (1955); Gaye Tuchman, "Objectivity as Strategic Ritual: An Examination of Newsmen's Notions of Objectivity," *American Journal of Sociology*, 77:660-79 (1972).

9. Although the press is routinely accused of being sensationalistic, few careful empirical analyses have been attempted on the subject. For a notable exception, see Percy H. Tannenbaum and Mervin D. Lynch, "Sensationalism: The Concept and Its Measurement," *Journalism Quarterly*, 37:381-92 (1960). In the present case the concept of sensationalism has been given a rather restricted meaning. Sensationalism usually bespeaks news accounts of ax murderers, drug-induced sex orgies and the like. This kind of news story was not examined in this study. Only stories which reported the views of scientific and medical authorities were considered. Criteria for the categorization of marijuana stories in this study are given in the Methodological Appendix.

10. Before 1967, little systematic research had been done on marijuana. By 1972, the marijuana controversy was at its height and a considerable amount of research had been reported in the scientific literature. In certain respects, 1972 represents a watershed in the marijuana debate, for that was the year in which the National Commission on Marijuana made public its findings.

11. For a discussion of the assumptions underlying the "pathology" orientation toward the non-medical use of drugs, see Erich Goode, "Drugs and Consciousness," *Dissent*, 19:644-50 (1972).

12. For a more detailed description of the content categories and scoring procedures, see Methodological Appendix.

13. "Scientific Output and Recognition: A Study in the Operation of the Reward System of Science," *American Sociological Review*, 32:377-90 (1967); "Visibility and the Structural Bases of Awareness of Scientific Research," *American Sociological Review*, 33:397-413 (1968).

14. "Citation Analysis as a Tool in Journal Evaluation," *Science*, 178:471-9 (1972).

15. In one sense the ideological pattern may be regarded as a subtype of the sensationalistic pattern. That is, by publicizing only the extreme views on a particular side of an issue, a journal is not only propagandizing on the issue but also sensationalizing it. On the other hand, a journal may sensationalize an issue without necessarily propagandizing in one direction or the other. In addition, these patterns may be regarded as hypothetical or ideal types. As ideal types they are mutually exclusive; in reality we should expect to find them mixed to some degree.

16. The highest possible standard deviation for pathology score distributions in this study is four. A standard deviation of four would mean that there was an equal number of positive to negative cases reported and that all scores assigned were either +4 or -4.

17. In brief summary of the content of these studies, the Isbell article reports the first successful attempt to administer laboratory-synthesized THC (the active chemical ingredient in marijuana) in precisely measured amounts to human subjects. The principal finding was that there is a typical dose-response relationship between THC and certain "psychotomimetic" effects which, at very high doses (much higher than would normally be taken by marijuana smokers), resemble symptoms associated with acute psychoses. In contrast, the Weil study represents the first laboratory-controlled experiment in which human subjects smoked typical "social amounts" of marijuana in the form of conventional marijuana cigarettes. The principal finding was that acute marijuana-induced effects produced by typical doses are relatively innocuous, experienced users actually improving their performances on a number of standard psycho-motor tests when under the influence of marijuana. The Hollister article, unlike the others, is not an empirical study, but a literature review and commentary article in which numerous reports are summarized to support the author's opinion that, both psychologically and socially, marijuana should be regarded as a dangerous drug. In the Lemberger study, the metabolism of THC in the human body was shown to take place relatively slowly, traces of THC being detected in the blood up to eight days after administration. At the same time, this result was hypothesized as a possible explanation of "reverse tolerance," a phenomenon often observed among regular marijuana users. (Tolerance is one of the effects associated with addiction to narcotic drugs; it is said to occur when, after continued use of a drug, an individual must take increasingly larger doses in order to achieve the same effects produced before by the same drug at lower doses. Among marijuana smokers, smaller, not larger, doses of marijuana are typically needed, as one becomes an experienced user, in order to get "high"; hence the concept of reverse tolerance.) Finally, mice rather than men were the experimental subjects of the Holtzman study, but definite extrapolations were suggested. The principal finding was that there is a dose-dependent relationship between THC and various neurochemical and behavioral changes. Thus, amine changes in rats' brains produced by varying amounts of THC were associated with varying amounts of diminished spontaneous activity and hypersensitivity to tactile and auditory stimuli.

18. Aside from the Isbell and Weil studies already described, the other three most publicized studies are remarkable for the extreme degree of pathology which they impute to marijuana. Though never taken too seriously by other researchers, the Geber investigation raises the spectre of marijuana-induced birth defects. Both the Kolansky and Talbott articles are clinical reports which identify marijuana as the direct and essential cause of severe mental illness in a number of patients. It could well be argued that these latter two articles, especially the Kolansky piece, are more notorious than reputable, having received widespread criticism from other investigators for the narrowness of their methods. At the same time, it is also true that their findings have been accepted by a number of investigators anxious to maintain a case against marijuana. In short, the Kolansky and Talbott articles are controversial within the scientific community. To what degree they are regarded for their scientific value and to what degree for their ideological value is something of a moot point. Methodologically much less controversial, the popularity of the

Weil study may, in part, also be attributed to the ideological implications of its central conclusion that, taken in normal social dosages, the acute effects of marijuana are innocuous. Since its publication the Weil report has become a standard reference for liberals.

19. See Methodological Appendix for a description of the scoring procedures followed for press articles.

20. It should be emphasized that the most frequent argument of those who maintain that marijuana is "addictive" is that it leads to "psychological dependence." Rare indeed is the assertion that marijuana is physiologically addictive in the same sense as heroin or other true narcotics. Many investigators, of course, view the net results of psychological dependence to be just as debilitating as physiological addiction. Others dismiss the concept as essentially meaningless. Definitions of psychological versus physiological addiction are given in the Appendix.

METHODOLOGICAL APPENDIX

Category Definitions and Scoring Procedures for Scientific Articles on Marijuana

The general content categories are: marijuana effects (physical, psychological, social); marijuana etiology (personality factors, social factors), and special issues (the addition hypothesis, the escalation hypothesis, the legal issue).

The first task is to determine for each article which of the general categories are appropriate. Some may be codeable in terms of a single category, others in terms of several. Thus one article might be confined to a discussion of certain physical effects of marijuana use, while another might discuss both physical and psychological effects and the legal issue—but have nothing to say about social effects, etiology, addiction or escalation.

The second task is to determine the "direction" of the judgments made. Judgments may: 1) *affirm negative features* of marijuana, for example, that marijuana is a cause of crime; or 2) *deny negative features*, for example, that marijuana use is not a cause of crime. Judgments may 3) *affirm positive features* of marijuana, e.g., that use stimulates creativity or 4) *deny positive features*, e.g., that marijuana use does not stimulate creativity. Judgments of types one and four are given a positive sign, i.e., they are considered to support the "pathology" view. Judgments of types two and three are given a negative sign to represent an "anti-pathology" view.

The third coding task is to evaluate the researcher's judgments in terms of basic analytical dimensions. Thus, if a judgment involves the general category *marijuana effects*, the analytical dimensions are: 1) Is this a relatively *mild* or *serious* effect? Ataxia or incoordination, photophobia (sensitivity to light), euphoria and alteration of space-time perception are relatively mild effects, while birth defects, cerebral atrophy, psychosis and violence are examples of serious effects. 2) Is this effect *acute* or *chronic* in its duration? Acute effects are transitory; they "wear off" once the active chemical ingredients of marijuana are metabolized, e.g., euphoria. Certain kinds of "psychotic reactions" represent acute effects. Chronic effects are relatively enduring, manifest even after the active chemical ingredients have been metabolized, e.g., cerebral atrophy. 3) Is the scientist's judgment made concerning this effect *qualified* or *unqualified*? Qualified statements use conditional language and are tentative, e.g., giving cautions concerning inferences and generalizations. ("Though there is a certain amount of evidence to indicate X, the possibility of Y cannot be discounted.") Unqualified statements are unconditional and absolutist; inferences and generalizations are unmitigated and unqualified. ("There can be no doubt that moderate to heavy use leads to X.")

When a judgment involves *marijuana etiology*, the analytical dimensions are: 1) Is the proposed factor held to be relatively *minor* or *major*? Among minor factors, pathology is not strongly emphasized and/or are presented as proximate rather than fundamental or underlying causes, e.g., using marijuana for pleasure,

relaxation or conviviality. Among major factors, pathology is stressed and these factors are presented as having basic causal influence on use, e.g., personality maladjustments, inability to cope with reality, disturbed family relationships, etc. 2) Is the researcher's judgment of this factor *qualified* or *unqualified*? (See 3 under marijuana effects.)

When the judgment being coded pertains to either the *addiction* or *escalation* issues, the analytical dimensions are essentially those for evaluating marijuana effects, since both addiction and escalation represent hypothesized consequences. The coding dimensions are: 1) Is the position taken on these issues *moderate* or *strong*? *Moderate* includes "psychological dependence" or the likelihood of using other drugs. *Strong* includes the conclusion that users develop a physiological addiction or that the chemical properties of marijuana *per se* provide a direct causal link to the use of more dangerous drugs. The conclusion that some "psychological dependence" may occur among some users or that the majority of marijuana users do not "graduate" to more dangerous drugs, illustrates moderate antipathology positions. The conclusion that "marijuana dependency" is meaningless and invalid, or that no chemical link whatsoever impels marijuana users to take more potent drugs, illustrates strong antipathology positions. 2) Is the position taken by the researcher on these issues "*qualified*" or "*unqualified*"?

Finally, if the article being coded passes judgment on the *legal issue*, the researcher's opinion is scored on a scale of +4 to -4 according to the following criteria:

In favor of criminalization:

Though penalties for use are too harsh, penalties against sale need to be maintained. (+1)

Though penalties for use may be too harsh (particularly in the case of first offenders), stringent penalties against sale need to be maintained (or increased). (+2)

Firm opposition to decriminalization with no distinction made between the categories of use and sale. (+3)

Penalties against both sale and use need to be maintained (or increased).(+4)

In favor of decriminalization:

Penalties against use need to be reduced (no mention is made regarding sale).(-1)

Penalties against both use and sale need to be reduced.(-2)

Eliminate penalties (i.e., legalize) for use but not for sale. (-3)

Eliminate penalties (i.e., legalize) for both use and sale. (-4)

Scoring Procedures

Each coding dimension has a predetermined score value. For the effects dimensions the values are: strong effect 2, chronic effect 1, unqualified effect 1, mild effect 0, acute effect 0, qualified effect 0. For etiological dimensions the predetermined score values are: major factor 2, unqualified factor 1, minor factor 0, qualified factor 0.

A score value for each pathology judgment coded is adduced on the basis of the particular *combination* of dimensions which make up the judgment. For example, the strongest judgment possible relative to marijuana effects would be one coded as serious, chronic and unqualified; the weakest possible judgment would involve an effect coded as mild, acute and qualified. Similarly, the strongest possible etiological judgment would involve a major factor which is unqualified, while the weakest judgment would be coded as a minor factor which is qualified. The possible combinations and their score values for both effects and etiology are as follows:

Effects:

strong	(2)	+	chronic	(1)	+	unqualified	(1)	= 4
strong	(2)	+	chronic	(1)	+	qualified	(0)	= 3
strong	(2)	+	acute	(0)	+	unqualified	(1)	= 3
strong	(2)	+	acute	(0)	+	qualified	(0)	= 2
mild	(0)	+	chronic	(1)	+	unqualified	(1)	= 2
mild	(0)	+	chronic	(1)	+	qualified	(0)	= 1
mild	(0)	+	acute	(0)	+	unqualified	(1)	= 1
mild	(0)	+	acute	(0)	+	qualified	(0)	= 0

Etiology:

major factor	(2)	+	unqualified	(1)	= 3
major factor	(2)	+	qualified	(0)	= 2
minor factor	(0)	+	unqualified	(1)	= 1
minor factor	(0)	+	qualified	(0)	= 0

Since the judgments receive either a positive or negative value, scores on the pathology scale range from +4.0 to -4.0 for marijuana effects, and from +3.0 to -3.0 for marijuana etiology. (Positive scores indicate a pathology view of marijuana, negative scores an anti-pathology view.)

To arrive at a summary pathology score (p) for an article as a whole as a sum of separate scores gives undue weight to the *number* of judgments, biasing the result in favor of articles which develop a number of themes, as against those which focus on a single question. If article A is coded as having made only one judgment about marijuana, but that one has serious implications (e.g., marijuana use leads to irreversible brain damage), a pathology score of +4.0 would result. If article B makes a series of judgments about marijuana, all of less serious implications (e.g., marijuana use causes nausea, inflammation of the throat, acute dis-equilibrium, "silly" behavior, etc.) and each judgment is given a p score of +1.0, simply summed, article B will receive a higher overall score than article A (+5.0 vs. +4.0), even though article A clearly represents a more pathological view of marijuana.

The easiest way to cure such bias, of course, is to sum the scores and divide by the number of judgments, yielding an average score. In this event, the summary score for article A would remain +4.0, while that for article B would become +1.0. Averaging, however, creates a different kind of bias, as when two articles both make very strong (+4) pathology judgments. If article C limits itself to a single judgment but article D makes, in addition, a number of other pathology

judgments scored +3, +3, +2 and +1, when the scores are averaged, article D will receive a lower summary score than article C (2.6 vs. 4.0) even though the orientation it expresses is at least as pathological as that of article C.

A scoring method was designed to minimize both kinds of bias discussed above by following two simplifying rules. The first was designed to simplify scoring *within* basic coding categories. It states that, if within a particular category (e.g., physical effects) more than one judgment has been coded, only one judgment will be included in the computation of the summary score and that will be the judgment assigned the highest score value. (The logic is somewhat similar to that of Guttman scaling, which assumes that the strongest judgment made with regard to a particular feature subsumes other observations made within the same category. Thus, if an authority believes marijuana causes brain damage and also causes headaches, slurred speech, impaired equilibrium, etc., all would be initially coded under physical effects, but only the former would be counted in the final scoring.)

The second rule is designed to simplify summing scores across categories (e.g., physical effects vs. psychological effects) to yield an overall score for the article. It states that the highest single score across categories will represent the summary score for the entire article, again mitigating the influence of the sheer number of observations coded were they to be summed, as well as the penalty against large numbers of observations, were they to be averaged. At the same time, one important virtue of averaging is preserved, i.e., the conceptual integrity of the original +4.0 to -4.0 pathology scale. Thus, if the coded judgments for article D are +4, +3, +3, +2 and +1, the summary score will be +4.0, the same as for article C.

An important special case is that in which both positive and negative pathology judgments are made in the same article. Here the problem is to develop a way of weighting both positive and negative observations. One solution would be to take the highest positive score and algebraically sum it with the highest negative score. This would be satisfactory as long as the ratio of negative to positive observations is more or less equal, but in the case where a large proportion of the observations are of one sign it would give undue weight to observations of the opposite sign. Suppose article E makes positive pathology judgments on physical effects of +4; psychological effects, +4; social effects, +4; etiological factors, +3; addiction, +3, and criminalization, -2. The highest positive score (+4) summed with the highest negative score (-2) would yield a pathology score of +2.0, failing to do justice to the disproportionate number of strong pathology judgments.

The scoring procedure used both the highest scores, positive and negative, as the basic units (an article cannot be scored higher than the highest single score for any of its particular judgments) and also takes into account the values of the scores of all observations made. The essential features of this procedure are: 1) Separate positive and negative judgments. 2) Within each select the highest score value. 3) Within each sum the scores of all observations coded. 4) The sum of the scores in each category represents a weight factor by which the highest score in the category is multiplied. 5) These weighted products are then algebraically summed. 6) The resulting summary score is reduced back into the original scale of +4.0 to -4.0 by dividing by the absolute sum of the positive and negative weight factors.

Applied to article E above, the scoring would go like this: $4+4+4+3+3+2 = +20 \times 4 = 80$; $-2 \times 2 = -4$. The algebraic sum $(80 + -4) = +76$. The absolute sum of positive and negative weight factors is 20 and $2 = 22$. The summary p score is $+76/22 = +3.46$.

A summary pathology score of 3.46 for these hypothetical data is to be compared with a score of +2.00 were the weighting procedures not introduced. The former score represents an equitable summary of all the observations while the latter is biased by the single negative observation. When followed for articles which do not present mixed pathology judgments, this procedure would give precisely the same results as could be obtained by taking the highest single score. In the above example, had there been no negative judgment regarding the escalation hypothesis, this procedure would have yielded a summary score of +4.0 ($20 \times 4 = 80$; $80/20 = 4.0$).

Scoring Procedures for Press Articles

The basic problem in assigning summary pathology scores to press articles centers around the fact that the views of more than one authority may be (and often are) reported in the same article. Thus, not only may a single authority make multiple judgments about marijuana, as is the case when scoring science articles, but in the press it is possible for several authorities to be making multiple judgments, some positive and some negative, all in the same article.

The simplest case occurs when a single author is quoted in the press. The judgments are coded in the regular way and the summary p score assigned to those statements represents the p score of the entire article.

The next simplest case occurs when multiple authorities are quoted, but all of their judgments are of the same sign (i.e., either all positive or all negative). In this event the following procedures were undertaken: 1) For each authority, the judgment having the highest score value is taken as a base and multiplied by the sum of the scores assigned to all of the authority's judgments, yielding a weighted score for each authority. 2) The weighted scores for all authorities are summed, producing a weighted score for the entire article. 3) The sum of the weighted scores for the entire article is reduced back into the framework of +4.0 to -4.0 by dividing by the sum of the weight factors. This final operation produces the p score value assigned to the article as a whole.

The following hypothetical case illustrates these procedures.

Press Article A	Coded p Judgments	
Authorities Quoted	*Per Authority*	*Weighted Score Values*
A	+4, +3, +2	$9 \times 4 = 36$
B	+4, +3	$7 \times 4 = 28$
C	+3	$3 \times 3 = 9$
D	+2	$2 \times 2 = 4$
E	+1	$1 \times 1 = 1$
	22	78

The summary p score value is $78/22 = 3.50$.

The most complex case occurs when multiple authorities are quoted in the same article and their judgments have different signs. The procedures in this event are similar to those above except that initially positive judgments are separated from negative judgments and then summed algebraically:

Press Article B *Authorities Quoted*	*Positive Judgments*	*Negative Judgments*
A	+4, +4	-2, -2
B	+4, +4	-2, -2
	Weighted + Score Values	*Weighted – Score Values*
	8 x 4 = 32	4 x 2 = 8
	8 x 4 = 32	4 x 2 = 8
	16 64	-8 -16

The algebraic sum of score values is +64 + -16 = +48.

The absolute sum of positive and negative weight factors is 16 and 8 = 24.

The summary *p* score is +48/24 = 2.00.